Observation of Double Bounce Scattering from Trees by GB-SAR (Understanding for each and integrated ecosystem using remote sensing, 6th International Symposium on Integrated Field Science)

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GB-SAR

Full polarimetric SAR like PALSAR has an advantage to measure polarimetric behavior of forest to evaluate biomass and so on. And it is important to understand how scatterings from trees occur. It is known that the scatterings from trees are divided into three component, single scattering, double bounce scattering and volume scattering. But it is not easy for us to confirm the scattering behavior by PALSAR, because we have few opportunities that PALSAR acquires a target which we want to measure. On the other hand, full polarimetric Ground Based SAR (GB-SAR) is a kind of Polarimetric SAR which is located on the ground. It is easy to measure due to its mobility and we can use it whenever we want to carry out a measurement. This is a great advantage of GB-SAR and it enables us to analyze the scattering behavior easily. Therefore, a double bounce scattering from trees was observed by G B- SAR to analyze the scattering behavior.

Observation of Double Bounce Scattering

First, in order to observe the double bounce scattering, a wall was chosen as a target because the wall structure is quite simple case to observe the double bounce scattering. In a radar profile, we can see two reflections at same azimuth position. One is a single scattering caused by the wall and the other is a double bounce scattering caused by an interaction between the ground and wall. This measurement is quite simple case, so this measurement can easily be simulated by using FDTD method. We can confirm how the double bounce scattering occurs in this simulation.

Second, an experiment was carried out to observe a double bounce scattering from trees. Two trees named T1 and T2 were chosen as targets. Although both of the trees should have two reflections according to previous measurement and simulation, T2 has two reflections but T1 has one reflection in the radar image. As for T2, One is a single scattering caused by a surface of the tree and the other is a double bounce scattering caused by the ground and a trunk of the tree. As for T1, the reflection is a single scattering.

Effect of Soil Moisture on Double Bounce Scattering

It is thought that this difference is caused by different soil moisture of ground surfaces. Soil moisture of the ground around T1 and T2 were 15% and 28% respectively, and higher soil moisture gives higher reflection coefficient. That is the reason why the double bounce scattering was weak in T1 and we cannot see it.

Index terms

full polarimetric SAR, Ground Based SAR, double bounce scattering